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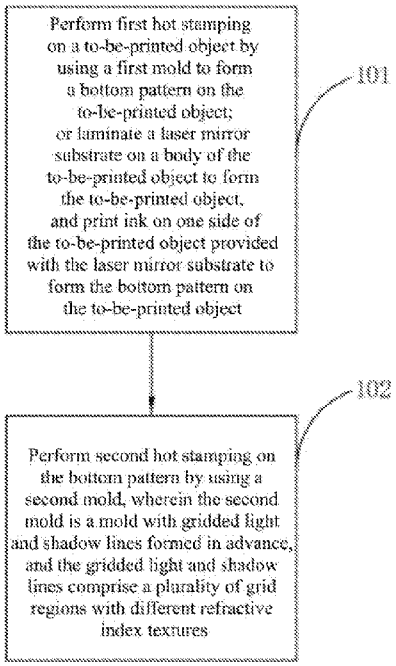

FIG. 1

(57) Abstract: A hot stamping process comprises the following steps: performing first hot stamping on a to-be-printed object by using a first mold to form a bottom pattern on the to-be-printed object; or laminating a laser mirror substrate on a body of the to-be-printed object to form the to-be-printed object, and printing ink on one side of the to-be-printed object provided with the laser mirror substrate to form the bottom pattern on the to-be-printed object (101); performing second hot stamping on the bottom pattern by using a second mold, wherein the second mold is a mold with gridded light and shadow lines formed in advance, and the gridded light and shadow lines comprise a plurality of grid regions with different refractive index textures (102). The hot stamping process can make different regions of the final pattern visually present light and dark differences, so that the printed pattern has a stereoscopic light and shadow effect; moreover, only two hot stamping procedures are needed to obtain the printed pattern with the stereoscopic light and shadow effect, and the molds used in these two procedures can directly operate on the to-be-printed object, so the hot stamping process is simple with low costs.

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HOT STAMPING PROCESS

TECHNICAL FIELD

[0001] The application belongs to the technical field of printing, and in particular, relates to a hot stamping process.

BACKGROUND

[0002] In order to attract consumers' attention, various patterns are always printed on the surface of articles, for example, hot stamping is a commonly used printing method. In order to improve the visual effect of printed patterns, people are not satisfied with the printing of plane patterns, but begin to explore the printing of stereoscopic patterns. At present, the printing of stereoscopic patterns may be realized by multi-layer printing, 3D printing, precision engraving and other technologies. However, these technologies can only create poor stereoscopic effect with a complicated manufacturing process.

SUMMARY

[0003] The embodiment of the application aims to provide a hot stamping process to solve the technical problems of poor stereoscopic effect and complicated manufacturing process in the existing stereoscopic printing technology.

[0004] To achieve the above purpose, the technical scheme adopted in this application is to provide a hot stamping process, which comprises the following steps:

[0005] performing first hot stamping on an to-be-printed object by using a first mold to form a bottom layer pattern on the to-be-printed object;

[0006] or laminating a laser mirror substrate on a body of the to-be-printed object to form the to-be-printed object, and printing ink on one side of the to-be-printed object provided with the laser mirror substrate to form a bottom pattern on the to-be-printed object; and

[0007] performing second hot stamping on the bottom pattern by using a second mold, wherein the second mold is a mold with gridded light and shadow lines formed in advance, and the gridded light and shadow lines comprise a plurality of grid regions with different refractive index textures.

[0008] According to one embodiment of the present application, the method for forming the gridded light and shadow lines of the second mold comprises the following steps:

[0009] forming a pattern model region in the second mold, wherein a pattern contour corresponding to the pattern model region is matched with a contour of the bottom pattern;

[0010] performing regional gridding on the pattern model region according to pre-configured

light and shadow parameters; and

[0011] forming different refractive index textures in different grid regions of the pattern model region according to the light and shadow parameters.

[0012] According to one embodiment of the present application, the forming different refractive index textures in different grid regions of the pattern model region according to the light and shadow parameters comprises the following step:

[0013] engraving and forming different refractive index textures in different grid regions of the pattern model region by using a laser engraving machine according to the light and shadow parameters.

[0014] According to one embodiment of the application, the laser engraving machine engraves and forms different refractive index textures in different grid regions of the pattern model region by emitting nano-level ultraviolet lights or sub-nano-level ultraviolet lights.

[0015] According to one embodiment of the present application, after the second mold forms the pattern model region and before different refractive index textures are formed in different grid regions of the pattern model region, the method further comprises the following step:

[0016] polishing the pattern model region.

[0017] According to one embodiment of the present application, a temperature for the first hot stamping is T1, and a temperature for the second hot stamping is T2, and T1>T2.

[0018] According to one embodiment of the present application, a temperature range of T1 is 160-180℃, and a temperature range of T2 is 125-135℃.

[0019] According to one embodiment of the present application, a speed of the first mold reaching the surface of the to-be-printed object is V1, and a speed of the second mold reaching the surface of the to-be-printed object is V2, and $V1 \geqslant V2$.

[0020] According to one embodiment of the present application, a pressure for the first hot stamping is P1, and a pressure for the second hot stamping is P2, and $P1 > P2$.

[0021] The hot stamping process provided by the application has at least the following beneficial effects: firstly, the first mold is used to perform the first hot stamping on the to-be-printed object to form the bottom pattern on the to-be-printed object. Then, the second mold with gridded light and shadow lines is used to directly perform the second hot stamping on the bottom pattern. Since the gridded light and shadow lines of the second mold include a plurality of grid regions with different refractive index textures, when the second mold is used for hot stamping on the bottom pattern, different regions of the final pattern can visually present light and dark differences, so that the printed pattern has a stereoscopic light and shadow effect, especially under the light. In addition, only two hot stamping procedures are needed to obtain the printed pattern with the stereoscopic light and shadow effect, and the molds used in these

two hot stamping procedures can directly operate on the to-be-printed object, so the hot stamping process provided by the application is simple with low costs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] In order to more clearly explain the technical schemes in the embodiments of this application, the following will briefly introduce the accompanying drawings needed in the description of the embodiments or the prior art. Obviously, the accompanying drawings in the following description are only some embodiments of this application. For those of ordinary skill in this field, other drawings may be obtained according to these drawings without creative labor.

[0023] FIG. 1 is a flow chart of a hot stamping process provided by an embodiment of the present application;

[0024] FIG. 2 is a schematic diagram of forming of a pattern model region provided by an embodiment of the present application;

[0025] FIG. 3 is a schematic diagram of division of different grid regions of gridded light and shadow lines provided by an embodiment of this application;

[0026] FIG. 4 is a cross-sectional view of a card in a hot stamping completion state according to an embodiment of the present application;

[0027] FIG. 5 is a schematic diagram of a concave-convex effect of the pattern formed by the hot stamping of the card in FIG. 4; and

[0028] FIG. 6 is a cross-sectional view of a card covered with a laser mirror substrate layer in a hot stamping completion state according to another embodiment of the present application.

DETAILED DESCRIPTION

[0029] In order to make the technical problems to be solved, technical schemes and beneficial effects of this application more clear, the application will be further explained in detail below with reference to the accompanying drawings and embodiments. It should be understood that the specific embodiments described here are only used to explain the application, and are not used to limit the application.

[0030] It should be noted that when an element is described as being "fixed" or "arranged" on another element, it may be directly or indirectly on the other element. When an element is described as being "connected to" another element, it may be directly or indirectly connected to the other element.

[0031] It should be understood that the orientation or positional relationship indicated by the terms "length", "width", "upper", "below", "front", "back", left, right, vertical, horizontal, top,

bottom, inside and outside is based on the orientation or positional relationship shown in the drawings, and the terms are only for the convenience of describing the application and simplifying the description, and do not indicate or imply that the referred apparatus or element must have a specific orientation, be constructed or operated in a specific orientation, so they cannot be understood as a limitation of the application.

[0032] In addition, the terms "first" and "second" are only used for descriptive purposes, and cannot be understood as indicating or implying relative importance or implicitly indicating the number of technical features. Therefore, the features defined by "first" and "second" may include one or more of these features explicitly or implicitly. In the description of this application, "multiple" means two or more, unless otherwise specifically defined.

[0033] The application provides a hot stamping process, as shown in FIG. 1, which comprises the following steps:

[0034] At Step 101, first hot stamping is performed on a to-be-printed object by using a first mold to form a bottom pattern on the to-be-printed object;

[0035] or a laser mirror substrate is laminated on a body of the to-be-printed object to form the to-be-printed object, and ink is printed on one side of the to-be-printed object provided with the laser mirror substrate to form the bottom pattern on the to-be-printed object;

[0036] At Step 102, second hot stamping is performed on the bottom pattern by using a second mold, wherein the second mold is a mold with gridded light and shadow lines formed in advance, and the gridded light and shadow lines comprise a plurality of grid regions with different refractive index textures.

[0037] The above-mentioned refractive index textures refer to concave-convex textures formed on the surface of the second mold according to different refractive indexes. Here, the refractive index refers to a ratio of a speed of light traveling in the air to a speed of light travelling in the sample.

[0038] The above-mentioned to-be-printed object may refer to a packing box, a card, etc. In the embodiment of the present application, printing an anti-counterfeiting mark on the card is taken as an example for explanation.

[0039] Please refer to FIG. 4 and FIG. 5. When hot stamping the card, the first mold may firstly be used for the first hot stamping on the card. Herein, a pattern which is a mirror image of the bottom pattern is formed on the surface of the first mold. During the hot stamping, a hot stamping film tape may firstly be placed on a to-be-printed region, and then the first mold is heated. When the temperature of the first mold reaches a preset temperature, the first mold is driven to run to attach a hot stamping part of the first mold to the hot stamping film tape. When the first mold operates on the hot stamping film tape for a period of time, a transfer film on

the hot stamping film tape is transferred to the to-be-printed region on the card, and the bottom pattern is formed on the surface of the card. At this time, the bottom pattern is still a plane pattern. In order to make the final pattern look stereoscopic, the second hot stamping is needed.

[0040] The second mold used in the second hot stamping directly operates on the bottom pattern. When the second mold is in contact with the bottom pattern and they are kept them in contact for a period of time, the gridded light and shadow lines of the second mold include a plurality of grid regions with different refractive index textures, i.e., the surface region of the second mold is actually composed of a plurality of regions with different refractive index textures. Since different regions have different refractive index textures, different processing roughness may be selected according to different refractive index textures, so the surface of the second mold has uneven textures. Therefore, when the second mold is used to realize the transfer of light and shadow lines, i.e., when the second mold is used to perform hot stamping on the bottom pattern, the finally formed pattern can have concave and convex textures. In this way, under the light, different regions of the formed final pattern will visually present light and dark differences, thus achieving the purpose of making the pattern hot-stamped on the surface of the to-be-printed object have a stereoscopic light and shadow effect. Moreover, based on the fact that the refractive index textures of different grid regions on the surface of the second mold are different, the refractive index textures of different grid regions may also be adjusted, so as to personalize the design of the formed final pattern.

[0041] Through the above hot stamping process, the final pattern formed on the to-be-printed object has a stereoscopic visual effect. Of course, the final pattern may be an icon or an anti-counterfeiting mark, etc. In addition, the above scheme only needs two hot stamping procedures to obtain a printing pattern with a stereoscopic light and shadow effect, and the molds used in these two procedures can directly opeartion on the to-be-printed object, without introducing a procedure of the transfer film, thus simplifying the process and reducing the hot stamping cost.

[0042] At the step 101, in addition to the first hot stamping performed on the to-be-printed object with the first mold, other method may also be adopted to form the bottom pattern on the to-be-printed object. For example, by improving the structure of the to-be-printed object, the final pattern formed on the to-be-printed object after the second hot stamping has a good stereoscopic effect.

[0043] Please refer to FIG. 6. Here, the above scheme will be still explained by taking a card being the to-be-printed object as an example.

[0044] First, one layer of laser mirror substrate layer is laminated inside the card body, and then related preparation is carried out to form the card. After the card is formed, a device such

as a printing plate may be used to print ink on the area of the card surface corresponding to the laser mirror substrate, so that the bottom pattern is formed on the card surface. Finally, the second mold is used to directly perform hot stamping on the bottom pattern, thus forming a pattern with the stereoscopic effect.

[0045] According to the above scheme, a laser mirror substrate layer is arranged inside the card, and then ink printing and hot stamping are carried out to form a pattern with the stereoscopic effect. This scheme saves the step of hot stamping by using the first mold, and avoids carrying out two times of hot stamping. Moreover, the arranged laser mirror substrate layer may also improve light-dark contrast of the light by improving reflection capability of the laser of the card surface, so that the finally formed pattern has a better stereoscopic effect. It should be noted that when laminating the laser mirror substrate layer, a laminate used may be a smooth laminate, so as to improve surface gloss of the laminated card.

[0046] Secondly, the gridded light and shadow lines may be formed on the surface of the second mold by engraving. Since engraving will affect the whole second mold, there are some requirements for materials used to make the second mold.

[0047] In the embodiment of the application, the first mold may be made of copper. In order to engrave the gridded light and shadow lines on the surface of the second mold, and to avoid deformation of the second mold during the engraving process to ensure sharpness of the lines, the second mold and the first mold may be made of different materials. For example, hardness of the second mold is higher than the hardness of the first mold. Illustratively, first, the second mold may be made of a special steel. Second, flatness and plasticity of the second mold are better than the flatness and plasticity of the first mold. This arrangement ensures that when the second mold is processed, it will not be deformed, softened or damaged.

[0048] It is easy to understand that the materials of the first mold and the second mold are not limited to the above listed ones, and are not listed here.

[0049] In one embodiment, a method for forming the gridded light and shadow lines of the second mold comprises the following steps:

[0050] a pattern model region is formed in the second mold, wherein a pattern contour corresponding to the pattern model region is matched with a contour of the bottom pattern;

[0051] regional gridding is performed on the pattern model region according to pre-configured light and shadow parameters; and

[0052] different refractive index textures are formed in different grid regions of the pattern model region according to the light and shadow parameters.

[0053] The formation of the gridded light and shadow lines of the second mold will be explained with reference to one specific embodiment below.

[0054] First, the pattern model region is formed on the surface of the second mold, and a pattern contour of the pattern model region is matched with a contour of the bottom pattern. Please refer to FIG. 2 and FIG. 3. The pattern contour may be formed according to a painting concept of sketch, i.e., the pattern contour is reflected through light-dark contrast.

[0055] Then, the pattern model regions may be grouped according to the refractive index by collecting the light and shadow parameters (i.e., the refractive indexes) of the pattern model regions. That is, the model regions whose refractive indexes are within a pre-configured parameter range are grouped together, and the grouped regions are regionally gridded. Then, different processing roughness is selected according to the collected refractive indexes. The region with a lighter color and a greater refractive index has smaller selected processing roughness. On the contrary, the region with a darker color and a smaller refractive index has greater selected processing roughness. In this way, the refractive index texture of the pattern model region can be manufactured, i.e., the details of different grid regions of the pattern model region can be obtained.

[0056] It should be noted that vector files may also be obtained according to the gridded lines. Patterns in different grid regions are designed through the vector files to assist in forming corresponding detailed patterns. The vector file is similar to a reference coordinate in CAD drawing software, and the coordinate data is continuously supplemented through the collected refractive indexes, so that the finally obtained vector file is horizontally mirrored with the bottom pattern, and after the second hot stamping, it presents a visually stereoscopic effect. In this way, the steps of forming the gridded light and shadow lines are simplified.

[0057] In one embodiment, forming different refractive index textures in different grid regions of the pattern model region according to the light and shadow parameters, comprising the following steps:

[0058] different refractive index textures are engraved and formed in different grid regions of the pattern model region by using a laser engraving machine according to the light and shadow parameters.

[0059] The laser engraving machine is used to process the roughness and refractive index texture of the pattern model region of the second mold. Since a beam diameter emitted by the laser engraving machine is relatively small, processing accuracy can be improved, so that the details of the obtained final pattern are more prominent and the stereoscopic effect of of the pattern is better.

[0060] In one embodiment, the laser engraving machine engraves and forms different refractive index textures in different grid regions of the pattern model region by emitting nano-level ultraviolet lights or sub-nano-level ultraviolet lights.

[0061] The following takes the laser engraving machine emitting sub-nano-level ultraviolet lights as an example to illustrate.

[0062] When the laser engraving machine adopts a DRACO ultraviolet laser machine, the laser machine emits ultraviolet lights of 300nm. Since a light spot of the ultraviolet lights is extremely small, and the thermal impact on the second mold during irradiation is extremely small, the pattern formed on the second mold has nano-level concave-convex textures. Since the concave-convex textures are of nano-level, if a person touches the surface of the second mold or the final pattern with hands, the touch is smooth and the person can hardly feel the concave-convex textures. However, in terms of the visual effect, the finally formed pattern has a special stereoscopic light and shadow effect, which can make the product bring a special sensory effect to users. In addition, the use of nano-level or sub-nano-level ultraviolet lights also improves the processing accuracy, and makes the pattern model formed on the second mold more exquisite.

[0063] In one embodiment, after the second mold forms the pattern model region and before different refractive index textures are formed in different grid regions of the pattern model region, the hot stamping process further comprises the following step: polishing the pattern model region.

[0064] In this way, not only the flatness of the pattern model region of the second mold can be further improved, but also this area can be kept clean, which provides convenience for subsequent design of roughness and refractive index textures, and improves the definition of the textures of the pattern corresponding to the pattern model region.

[0065] In one embodiment, a temperature for the first hot stamping is T1, a temperature for the second hot stamping is T2, and $T1 > T2$.

[0066] During the first hot stamping, the first mold is heated to transfer the transfer film of the hot stamping film tape onto the card surface. During the second hot stamping, the second mold is heated, and the heated second mold directly operates on the transfer film. Since a high temperature will affect the refraction effect of the transfer film, and many hot stamping processes may lead to whitening of the film layer, the heating temperature T2 of the second mold is lower than the heating temperature T1 of the first mold. In this way, the refraction effect of the transfer film will not be affected, and the light and shadow lines of the second mold is ensured to be smoothly transferred to the transfer film during the second hot stamping. Herein, the temperature difference between the heating temperature T2 for the second mold and the heating temperature T1 for the first mold is about 28℃ to 35℃. For example, the temperature difference between the heating temperature T2 for the second mold and the heating temperature T1 for the first mold is 30℃.

[0067] In one preferred embodiment, a temperature range of the first hot stamping is 160-180℃, and a temperature range of T2 is 125-135℃. That is, when the final heating temperature for the first mold is in the range of 160-180℃ and the final heating temperature for the second mold is in the range of 125-135℃, the influence on the refraction effect of the transfer film is minimal.

[0068] In one embodiment, a speed of the first mold reaching the surface of the to-be-printed object is V1, and a speed of the second mold reaching the surface of the to-be-printed object is V2, and V1≥V2.

[0069] During the hot stamping process, there is a certain distance between the used mold and the to-be-printed object. When the mold starts working, the mold descends from an initial height, i.e., the distance between the mold and the to-be-printed object gradually decreases until the mold attaches to the surface of the to-be-printed object, and the mold stops moving. When the mold is in contact with the surface of the to-be-printed object for a period of time, the mold starts to move, and the distance between the mold and the to-be-printed object gradually increases. In this way, a single hot stamping is realized.

[0070] If the mold moves too fast, it will make the card shake, resulting in deviation between the contact position between the mold and the to-be-printed object and a preset position. Especially, when the first mold is used for performing hot stamping on the to-be-printed object, a hot stamping film tape is further arranged between the mold and the to-be-printed object, then the shaking of the card will make the hot stamping film tape move, so that part of the hot stamping film tape is located outside a to-be-printed region, and only part of the formed bottom pattern is printed. Worse still, the second mold directly operates on the bottom pattern formed by the first hot stamping. In order to ensure that the contact regions between the two molds and the to-be-printed object overlap with each other during the two hot stamping, it is necessary to make the descending speed of the second mold lower than the descending speed of the first mold, so as to increase overlap regions of the two hot stamping as much as possible. In this way, the stereoscopic effect of the finally formed pattern can be ensured.

[0071] In order to further improve the accuracy of die hot stamping, the hot stamping position may also be positioned.

[0072] Illustratively, the mold may be installed on a hot stamping device. When the first hot stamping is performed, the first mold is installed, and when the hot stamping on the bottom pattern is finished, the first mold returns to an initial position. At this time, the first mold may be replaced by the second mold manually or by a robot arm, so that the second hot stamping can be performed later. According to the method, the distance between the molds used for the two hot stamping and the to-be-printed object does not change, so that the two hot stamped

regions overlap with each other without any deviation.

[0073] In addition to the above method, two hot stamping stations may be set on the hot stamping device, i.e., one station for placing the first mold and one station for placing the second mold. The two hot stamping stations are spaced at intervals, and the cards are placed on a conveyor belt arranged for hot stamping, and are driven by the conveyor belt, the cards can sequentially pass through the first mold and the second mold. When the card reaches an operation region of the first mold, the first mold performs the first hot stamping on the card, so that the bottom pattern is formed on the card. Then the card comes into an operation area of the second mold, and the second mold performs the second hot stamping on the card to form the bottom pattern on the card, so that the finally formed pattern has a stereoscopic effect.

[0074] In one embodiment, a pressure for the first hot stamping is P1, a pressure for the second hot stamping is P2, and P1＞P2.

[0075] Since the surface of the second mold used for the second hot stamping has gridded light and shadow lines, and excessive pressure may damage the light and shadow lines on the surface of the mold, in order to protect the light and shadow lines, the pressure on the second mold is smaller than the pressure on the first mold. It is easy to understand that the second mold directly operates on the transfer film. Therefore, if the pressure on the second mold is high, part of the region of the transfer film will be easily deformed, thus affecting the pattern transfer effect (i.e., the stereoscopic effect of the final pattern) during the second hot stamping.

[0076] The above are only preferred embodiments of this application, and they are not intended to limit this application. Any modification, equivalent substitution and improvement made within the spirit and principle of this application should be included in the scope of protection of this application.

CLAIMS

1. A hot stamping process, comprising the following steps:

performing first hot stamping on a to-be-printed object by using a first mold to form a bottom pattern on the to-be-printed object;

or laminating a laser mirror substrate on a body of the to-be-printed object to form the to-be-printed object, and printing ink on one side of the to-be-printed object provided with the laser mirror substrate to form the bottom pattern on the to-be-printed object; and

performing second hot stamping on the bottom pattern by using a second mold, wherein the second mold is a mold with gridded light and shadow lines formed in advance, and the gridded light and shadow lines comprise a plurality of grid regions with different refractive index textures.

2. The hot stamping process according to claim 1, wherein the method for forming the gridded light and shadow lines of the second mold comprises:

forming a pattern model region in the second mold, wherein a pattern contour corresponding to the pattern model region is matched with a contour of the bottom pattern;

performing regional gridding on the pattern model region according to pre-configured light and shadow parameters; and

forming different refractive index textures in different grid regions of the pattern model region according to the light and shadow parameters.

3. The hot stamping process according to claim 2, wherein the forming different refractive index textures in different grid regions of the pattern model region according to the light and shadow parameters comprises:

engraving and forming different refractive index textures in different grid regions of the pattern model region by using a laser engraving machine according to the light and shadow parameters.

4. The hot stamping process according to claim 3, wherein the laser engraving machine engraves and forms different refractive index textures in different grid regions of the pattern model region by emitting nano-level ultraviolet lights or sub-nano-level ultraviolet lights.

5. The hot stamping process according to claim 2, wherein after the second mold forms the pattern model region and before different refractive index textures are formed in different grid regions of the pattern model region, the method further comprises:

polishing the pattern model region.

6. The hot stamping process according to claim 1, wherein a temperature for the first hot stamping is T1, and a temperature for the second hot stamping is T2, and $T1 > T2$.

7. The hot stamping process according to claim 6, wherein a temperature range of T1 is 160-180℃, and a temperature range of T2 is 125-135℃.

8. The hot stamping process according to claim 1, wherein a speed of the first mold reaching the surface of the to-be-printed object is V1, and a speed of the second mold reaching the surface of the to-be-printed object is V2, and $V1 \geqslant V2$.

9. The hot stamping process according to claim 1, wherein a pressure for the first hot stamping is P1, and a pressure for the second hot stamping is P2, and $P1 > P2$.

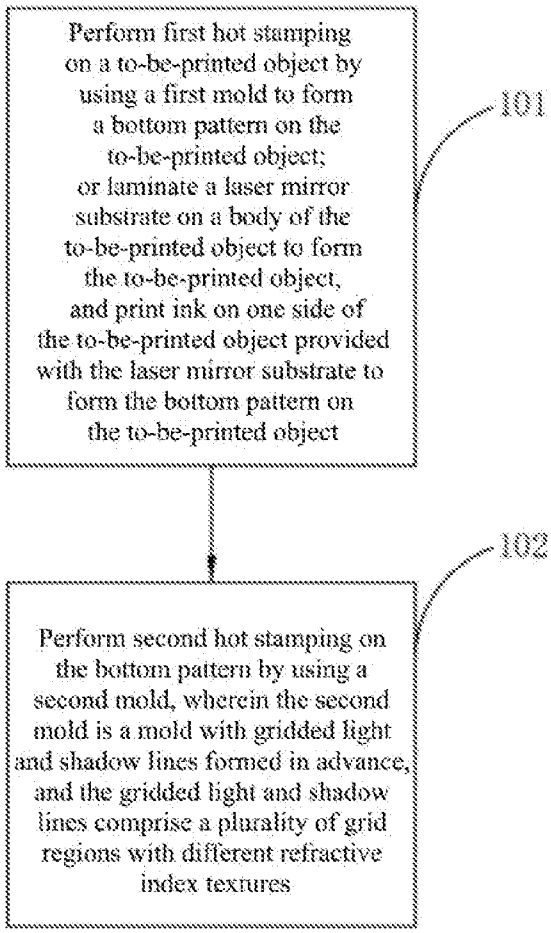
Perform first hot stamping on a to-be-printed object by using a first mold to form a bottom pattern on the to-be-printed object; or laminate a laser mirror substrate on a body of the to-be-printed object to form the to-be-printed object, and print ink on one side of the to-be-printed object provided with the laser mirror substrate to form the bottom pattern on the to-be-printed object
101
Perform second hot stamping on the bottom pattern by using a second mold, wherein the second mold is a mold with gridded light and shadow lines formed in advance, and the gridded light and shadow lines comprise a plurality of grid regions with different refractive index textures
102

FIG. 1

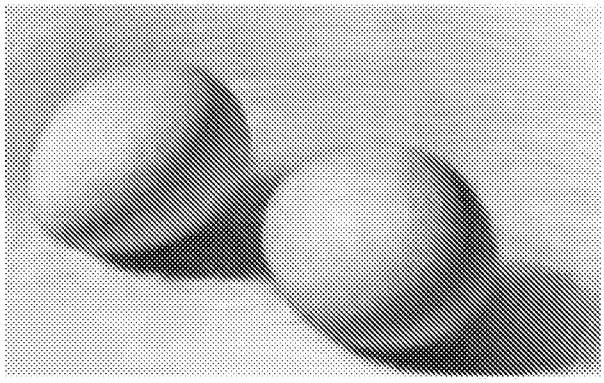

FIG. 2

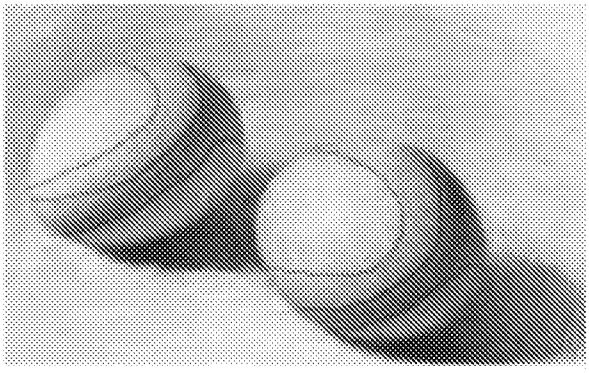

FIG. 3

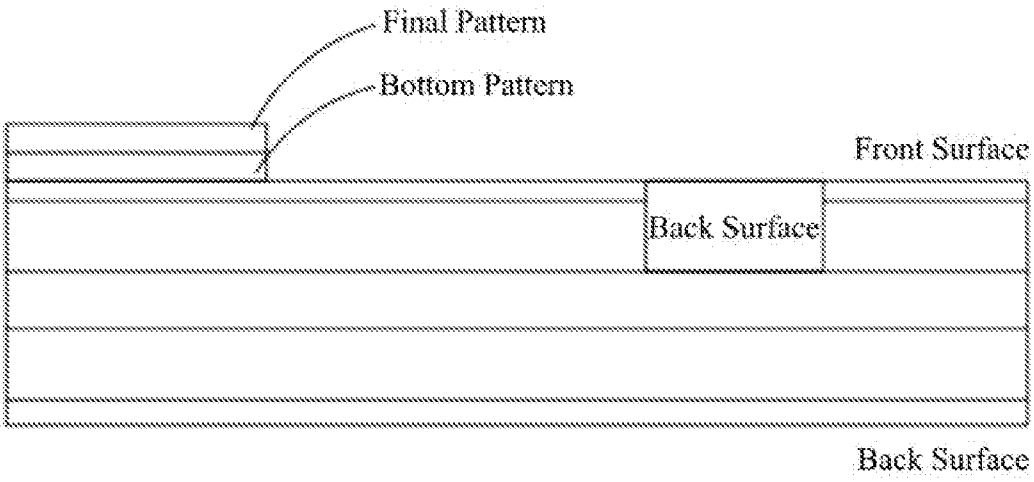

FIG. 4

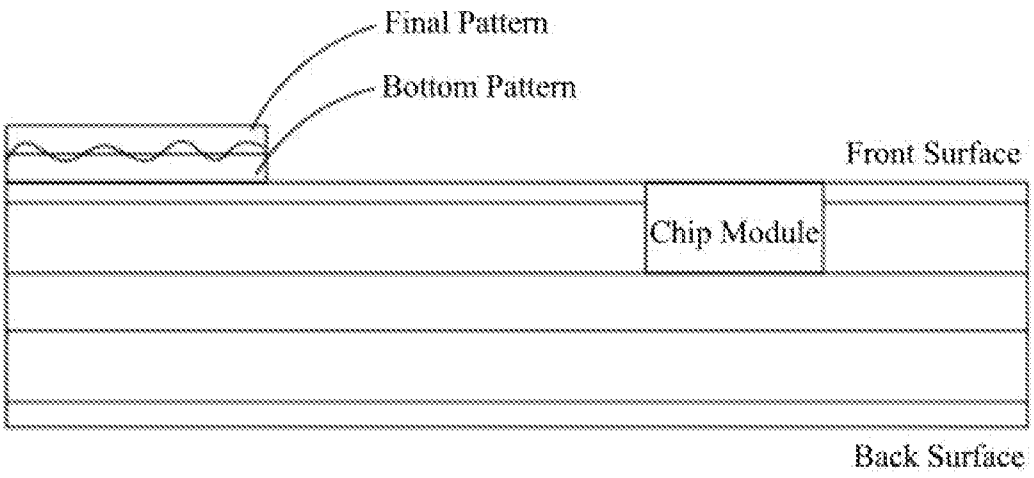

FIG. 5

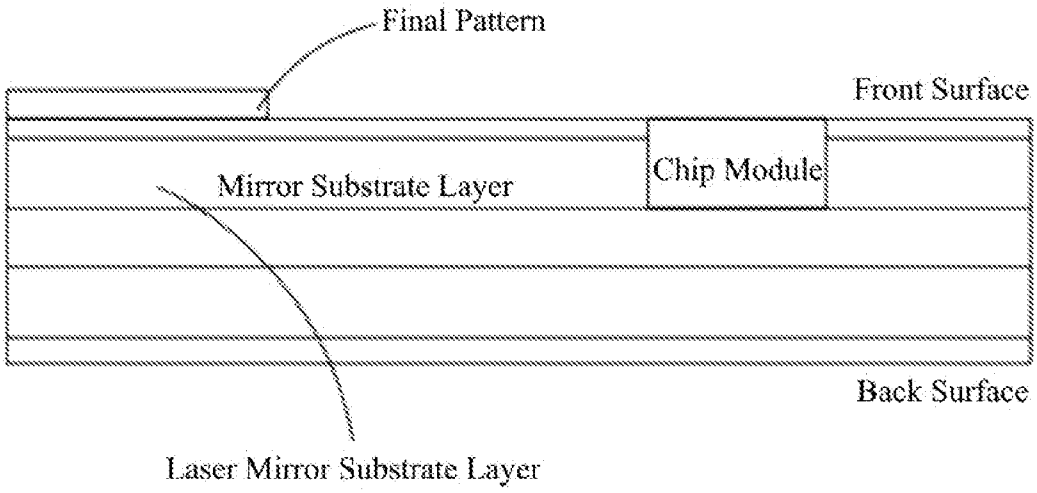
Final Pattern
Front Surface
Chip Module
Mirror Substrate Layer
Back Surface
Laser Mirror Substrate Layer

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/126955

A. CLASSIFICATION OF SUBJECT MATTER

B41M 5/382(2006.01)i; B41F 19/06(2006.01)i; B44C 1/17(2006.01)i; B44C 1/24(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B41M 5/-; B41M 1/-; B41F 19/-; B44C 1/-

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS, WPABS, DWPI, ENTXT, WOTXT, CJFD: GIESECKE, ZENGTENG, stamp+, emboss+, thermoprint+, mold, die, laser, engrav+, halftone, 3D, three-dimension, relief, grid, refractive index

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 113910799 A (GIESECKE+DEVRIENT CHINA TECHNOLOGIES CO., LTD.) 11 January 2022 (2022-01-11) claims 1-9	1-9
Y	CN 107264024 A (ZHOU, Yong) 20 October 2017 (2017-10-20) description, paragraphs [0027]-[0043], and figures 1-3	1-9
Y	WO 0185473 A1 (BLOCKFOIL GROUP LTD. et al.) 15 November 2001 (2001-11-15) description, page 7, line 10 to page 10, line 10 and figures 1-4	1-9
Y	GB 2488325 A (TENG TSAI SPECIAL PRINTING CO., LTD.) 29 August 2012 (2012-08-29) description, page 5, line 7 to page 9, line 8	1-9
Y	CN 206999887 U (ZHOU, Yong) 13 February 2018 (2018-02-13) description, paragraphs [0026]-[0042], and figures 1-3	1-9
A	CN 111942070 A (ZENGHE PACKING CO., LTD.) 17 November 2020 (2020-11-17) the whole document	1-9
A	CN 109677149 A (GIESECKE+DEVRIENT CHINA TECHNOLOGIES CO., LTD.) 26 April 2019 (2019-04-26) the whole document	1-9

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 January 2023	**20 January 2023**
Name and mailing address of the ISA/CN **National Intellectual Property Administration, PRC** **6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088, China** Facsimile No. **(86-10)62019451**	Authorized officer **WANG,Fang** Telephone No. **86-(010)-62085096**

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2022/126955

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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CN 111942070 A	17 November 2020	None	
CN 109677149 A	26 April 2019	WO 2020168988 A1	27 August 2020
		EP 3927548 A1	29 December 2021
CN 104608512 A	13 May 2015	None	